IN THE CLAIMS

This listing of claims replaces all prior versions, and listings, in this application.

1. (previously presented) A process for creating an analytical closed form model of the earth's subsurface area heat flow and its error bounds by stochastic analysis so that the model can be used to evaluate the thermal state of the earth for related oil and natural gas analyses and/or tectonic studies or studies related to crystallization of minerals, said process comprising:

inputting values to a computer representing random thermal conductivity, an exponentially decreasing heat source and associated boundary conditions;

using in said computer a stochastic heat conduction equation based on said input random thermal conductivity, exponentially decreasing heat source and associated boundary conditions to devise a stochastic solution to the temperature field obtained using a series expansion method, and

obtaining from said computer an output representing an expression for mean heat flow and variance in heat flow.

2. (previously presented) A process as in claim 1 wherein the boundary conditions are surface temperature and surface heat flow.

3. (previously presented) A process as in claim 1 wherein the stochastic heat conduction equation is of the formula $\frac{d}{dz}\left\langle K(z)\frac{dT}{dz}\right\rangle = -A(z)$.

4. (previously presented) A process as in claim 1 wherein the stochastic heat conduction equation is solved using a series expansion method to obtain the closed form solution to the mean and variance in the heat flow fields, and using thermal conductivity of the subsurface layer of the earth's crust as a random parameter.

5. (previously presented) A process as in claim 1 wherein the expression for heat flow is obtained and the expressions for the mean and variance in heat flow derived by taking expectation and using the property of the random field.

6. (previously presented) A process for evaluating of the thermal state of the earth for use in related oil and natural gas application in tectonic studies and/or in studies related to the crystallization of minerals, said process comprising:

quantifying the earth's subsurface area heat flow and its error bounds by stochastic analysis by

inputting values representing random thermal conductivity, an exponentially decreasing heat source and associated boundary conditions;

using a stochastic heat conduction equation based on said input random thermal conductivity, exponentially decreasing heat source and associated boundary conditions to devise a stochastic solution to the temperature field obtained using a series expansion method, and

obtaining and outputting as a tangible result an expression for mean heat flow and variance in heat flow for use in said oil and natural gas analysis, tectonic studies and/or studies related to the crystallization of minerals.

7. (previously presented) A process as in claim 6 wherein the boundary conditions are surface temperature.

8. (previously presented) A process as in claim 6 wherein the stochastic heat condition equation is of the formula $\frac{d}{dz}\left\langle K(z)\frac{dT}{dz}\right\rangle = -A(z)$.

9. (previously presented) A process as in claim 6 wherein the stochastic heat conduction equation is solved using a series expansion method to obtain the closed form solution to the mean and variance in the heat flow fields, and using thermal conductivity of the subsurface layer of the earth's crust as a random parameter.

10. (previously presented) A process as in claim 6 wherein the expression for heat flow is obtained and the expressions for the mean and variance in heat flow derived by taking expectation and using the property of the random field.